COVER PHOTOS
The cover photos show a recent MES field balancing job. Bently Nevada's MES representative (inset) used a Level I Host Processor in conjunction with the Smart Monitor to determine the placement of the calibration weights on a newly-overhauled compressor.

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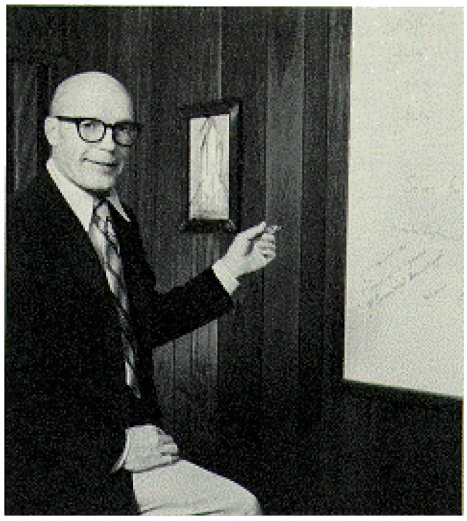
Bently's Corner



Meaningful machinery information

By Donald E. Bently
President and Chairman

Two years ago Bently Nevada changed its business definition from machine protection to machinery information. This does not mean that we no longer manufacture machinery protection instruments. We do. But we also recognize that advances in computer and information processing technologies offer machinery protection users an added dimension to their protection systems — machinery information.

What is machinery information?

Over the past 10 years, the industry has expended considerable effort in attempting to automatically capture predictive maintenance data from machinery protection systems. This has been attempted by using computers to process data from transducers. Most of these efforts have been less than successful in providing meaningful machinery information.

"Meaningful" information is the key. These systems are capable of generating literally tons of data (computers spit it out non-stop), yet the data does not always contain the necessary information to make proper decisions.

Who needs machinery information?

For these systems to be successful, the information must be what the user both needs and wants to know, in highly readable and easy-to-interpret formats. If it is less than that, the information is worthless.

So in planning a machinery information system, first you must identify who needs machinery data in your operation and what types of information they need to make sound decisions.

Data isn't everything to everybody. One piece of information may be highly relevant to a maintenance engineer, for example, and entirely meaningless to a machine operator.

In a typical process plant operation, three groups of people require information on the condition of rotating machinery — the machine operator, plant engineer, and machinery specialist. But they don't require the same types of information.

The machine operator

The machine operator is primarily concerned with keeping the machinery running so the product can be produced on schedule. He needs only data which he can reasonably act upon.

For critical machinery, this is typically process information and control parameters as well as a number of supervisory parameters, which give the operator a general overview of the status of the plant. The machinery supervisory parameters normally include such things as overall vibration level, alarm status, axial position indication, bearing temperatures, speed, differential expansion, sequence of events, and trend analysis.

These operator parameters are comparatively slow changing and are often referred to as static or quasi-static information. Static and quasi-static information enables the machine operator to know whether the machine is within normal operating parameters. He also is able to observe the effects of process changes on the mechanical operation of the machine.

Current technology allows for easy routing of static and quasi-static information to the plant process computer or other computer displays through data concentration techniques. Bently Nevada now offers such an option, the Data Manager,™ for new and existing 7200 Series monitor systems.

The plant engineer

The plant engineer needs information on which to base maintenance decisions.

He is concerned with how long a machine can operate in its present condition, what is mechanically wrong with the machine, and when downtime should be scheduled. He wants to know whether the machine needs to be overhauled or repaired, what needs to be done during shutdown, what caused the machine train to automatically shut down, and whether the machine can be restarted without detailed mechanical inspection. He uses this information to minimize unscheduled plant downtime and to ensure the proper mechanical operation and maintenance of machinery.

To make these decisions, the plant engineer needs the same overall values and trends as the machine operator, plus steady-state dynamic vibration data, and correlative process information.

He receives steady-state dynamic data from installed motion transducers in the form of vibration waveforms, shaft orbits, spectrums, impedances, rotative speed amplitudes and phases. This steady-state dynamic data is comparatively fast changing and requires technologies and data communications links not normally found in operating plants, even in those with modern plant process computers.

In most facilities today, dynamic data is taken on-line with separate transportable instruments. Presentations are generated by separate instruments, such as oscilloscopes, vector filters, and spectrum displays. These instruments generally require that they be brought to the machinery site or monitor location to acquire data.

Computer technology now makes it possible to bring the information directly to the plant engineer. This is accomplished by interfacing monitoring systems to computers and, thus, creating a steady-state dynamic data collection/communication system, like the Bently Nevada Smart Monitor.[9]

The computer interface enables steady-state dynamic data to be sent on a digital serial link for analysis by the plant engineer at a central location while keeping plant wiring costs at a minimum. The link is a standard feature of the Smart Monitor system.

The machinery specialist

The machinery specialist needs transient dynamic information as well as steady-state and dynamic steady-state data to perform machine analysis and diagnosis. He uses this information in acceptance testing and in commissioning new or overhauled machinery. The transient dynamic data is required to troubleshoot machine malfunctions and diagnose system design or operational problems. Information on the fundamental rotor dynamics of the machine enables him to eliminate the root cause of a problem.

The machinery specialist gets this information from many sources. Some records are generated by portable data acquisition instruments, and he has access to the information stored in the plant engineer's computer system.

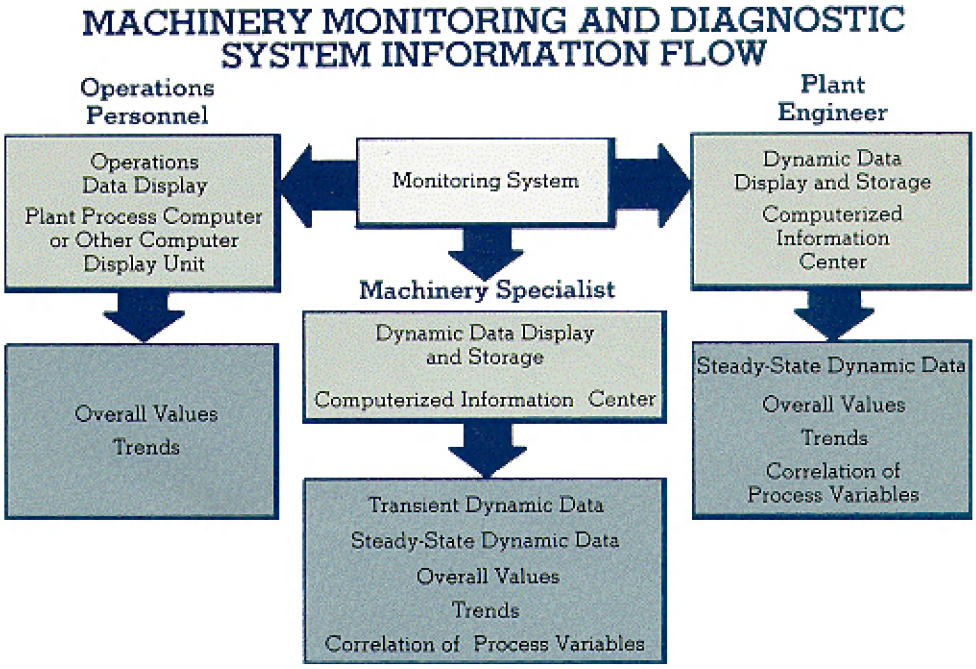
For transient dynamic data, he often uses a computerized data acquisition system, like the ADRE,[10] and a tape recorder. The computerized data acquisition system enables the machinery specialist to capture rapidly changing dynamic data, which occurs during startup and shutdown, and put it in the form of Bode', polar, cascade spectrum, and time base plots.

The need for flexible systems

The machinery specialist, plant engineer, and plant operator all need information, sometimes similar and other times dissimilar. Yet, the types of data each needs can vary from plant to plant depending on the type of plant and operational philosophies and structure within the facility.

This requires machinery information systems that are designed for maximum flexibility and adaptability, according to each user's unique situation. For instance, you may want a complete machinery information system, from transducer to monitor to computer. But another user may want to interface the transducer and monitor information into an already existing plant process computer. Bently Nevada machinery information systems are designed to do both.

The computer and information processing technologies make this flexibility possible. For more than 20 years, Bently Nevada has manufactured high-quality, reliable instruments for monitoring the condition of rotating machinery. Today, we are linking these same instruments to computers to provide **meaningful** information based on your unique applications and plant requirements.



Overall Values: Instantaneous values of supervisory parameters.

Steady-State Dynamic Data: Vibration signals from machinery transducers taken while the machine is on line.

Transient Dynamic Data: Vibration signals taken from machinery transducers while the machine is changing condition, such as speed, load, startup, and shutdown.